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論文審査の結果の要旨及び担当者

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論文審査の結果の要旨

目的

本研究の主な目的は、飛行時間型及び通常のFDG PET-CTを用いて、進行性非ホジキンリンパ腫とインドレントリンパ腫を識別できるバランスのとれたカットオフ値を決定することである。

方法

大阪大学医学部附属病院は2008年1月から2016年12月の間にFDG-PET / CTを受けた非ホジキンリンパ腫患者を対象に遡及解析を行う。 研究の組み入れ基準は以下の通りである：腫瘍組織一種しか含まれていない、組織病理学的に確定された非ホジキンリンパ腫；治療前（新規）の症例は、生検とFDG-PET / CTスキャンの間の期間が90日未満；治療後（再発）の症例は、最後の治療コースから6ヵ月以上経過； 血糖値は150mg / dl未満であること。

結果

新規症例における非TOF PET / CT（n = 204）の分析は、活動性およびインドレントのNHLの間の最も平均のとれたカットオフとして10のSUVmaxを示し、特異度は94％であり、感度は71％であった。 一方、SUVmaxの13値は、TOF PET / CT（n = 57）では最も平均のとれたカットオフであり、特異度は95.5％、感度は77％であった。

学位に値するものと認める。

論　文　内　容　の　要　旨

Synopsis of Thesis

氏　名 Name	Galal Salem Moubark Alobthani
論文題名 Title	**Value of ^{18}F-FDG PET/CT in discrimination between indolent and aggressive non-Hodgkin's lymphoma: A study of 328 patients** （緩慢性および進行性非ホジキンリンパ腫の識別における^{18}F-FDG PET / CTの価値：328症例の研究）

論文内容の要旨

Purpose

Non-Hodgkin's lymphoma (NHL) cases with inconclusive biopsy findings are not infrequently referred for fluorine-18-fluorodeoxyglucose positron emission tomography/computed tomography (^{18}F-FDG PET/CT). We searched for maximum standardized uptake value (SUVmax) cut-off values that could discriminate between indolent and aggressive NHL in conventional non-time of flight (non-TOF) ^{18}F-FDG PET/CT and TOF ^{18}F-FDG PET/CT. The other aim was to check whether the detection rate of NHL subtypes in non-TOF ^{18}F-FDG PET/CT differs from that in TOF ^{18}F-FDG PET/CT.

Methods:

A retrospective analysis was done for all NHL patients who underwent ^{18}F-FDG PET/CT in the period between January 2008 - December 2016 at Osaka University Hospital. 328 patients were selected by the following inclusion criteria: biopsy-proven NHL with no more than one histopathological type; new cases with less than 90 days between obtaining biopsy and ^{18}F-FDG PET/CT scanning; recurrent cases with time interval more than six months since the last therapy with no history of transformation; and blood glucose less than 150mg/dL. 55% of patients had aggressive NHL, and 45% indolent NHL. In aggressive NHL; 83.4% were new cases. In indolent NHL; new cases were 75%. ^{18}F-FDG was intravenously injected; 3.7 Mega Becquerel (MBq) / kg of body weight. SUV calculation was based on the body weight; SUV= [decay corrected activity (kBq)/tissue volume (mL)]/[injected ^{18}F-FDG activity (kBq) / body weight (g)]. Abnormal foci were lesions with SUVmax of ^{18}F-FDG ≥2.5.
246 patients were scanned with non- TOF PET/CT; in which the images reconstruction was done by non-TOF- based ordered subset expectation maximization (OSEM) related algorithm. Non-TOF PET/CT had gadolinium-based crystals, timing resolution of 7.5ns, and spatial resolution of 5.2mm. 82 patients were scanned with TOF PET/CT; with TOF- based OSEM. TOF PET/CT had lutetium-yttrium based-crystals, timing resolution of 4.9ns, and spatial resolution of 4.7mm. Receiver operating characteristics (ROC) curve was used to determine the cut-off value between indolent and aggressive NHL. The cut-off was selected by the highest [sensitivity- (1-specificity)].

Results:

The SUVmax of NHL tends to be higher in TOF PET/CT than non-TOF PET/CT. The mean of increment in SUVmax in TOF PET/CT was 31.5%. New aggressive NHL had significantly higher SUVmax than new indolent NHL in both, non-TOF PET/CT (13.6±7.7 vs. 5.3±3.4, P<0.0001) and TOF PET/CT (20.5±9.8 vs. 6.6±4.7, P<0.0001). ROC analysis for new cases in non-TOF PET/CT (n=204), demonstrated SUVmax of 10 as the most balanced cut-off between aggressive and indolent NHL, with the area under the curve (AUC) of 86%, specificity of 94%, and sensitivity of 71%. While SUVmax of 13 was the most balanced cut-off for new cases in TOF PET/CT (n=57), with AUC of 91%, specificity of 95.5%, and sensitivity of 77%. A value of 10 as SUVmax cut-off in non-TOF PET/CT had 34 false negative (FN) cases. 22 FN cases were diffuse large B-cell lymphoma (DLBCL). Nasopharynx was the most worrisome area for DLBCL FN cases. Six FN cases were follicular lymphoma grade III and the neck LN was the most worrisome area. 13 as SUVmax cut-off for TOF PET/CT cases, had 8 FN cases. No significant differences were found in the detection rates of NHL subtypes (new and recurrent) between non- TOF PET/CT and TOF PET/CT, when using SUVmax of 2.5 as the normal upper limit.

Conclusion

SUVmax>10 in non-TOF ^{18}F-FDG PET/CT and >13 in TOF ^{18}F-FDG PET/CT were highly suggestive of an aggressive nature of NHL, while there was an overlap between indolent and aggressive NHL in the lower SUVmax levels.